

9 June 2016

RENEWABLE ENERGY COST TRENDS

Down, down, down

Vandana Gombur

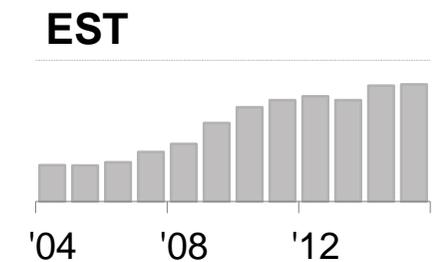
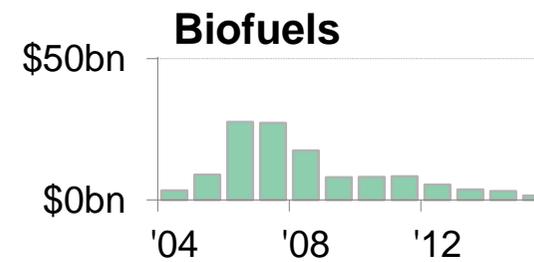
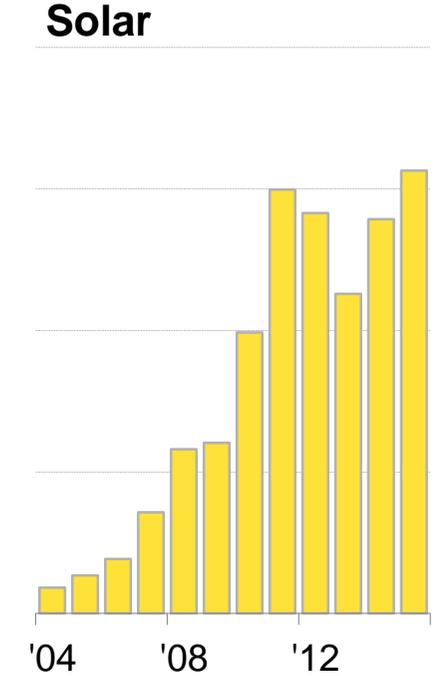
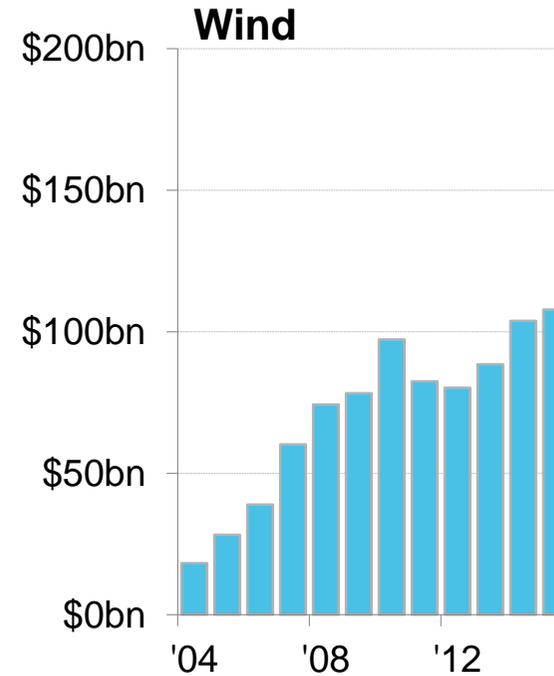
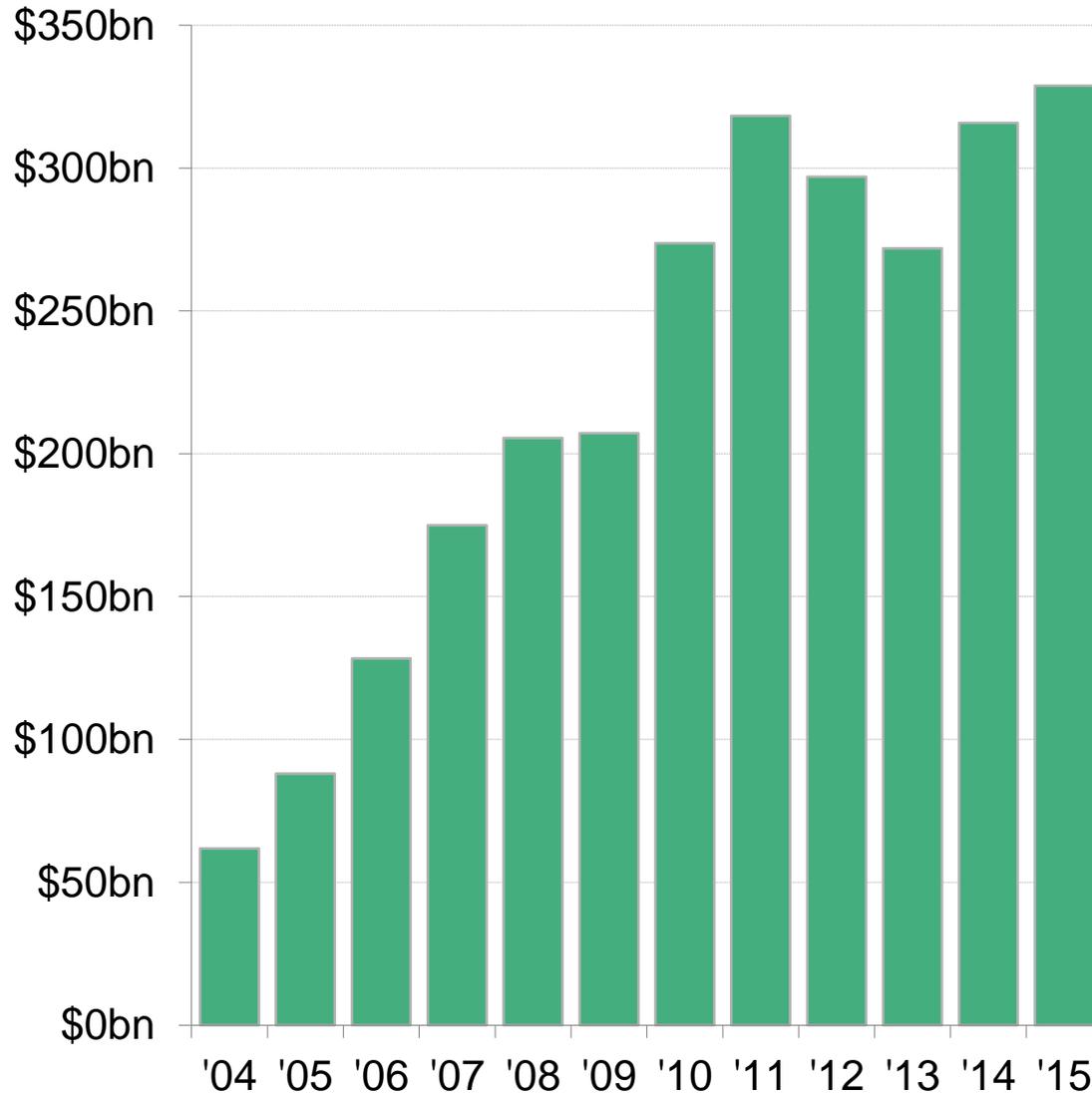
Bloomberg
NEW ENERGY FINANCE

200 EXPERTS ACROSS SIX CONTINENTS



NEW FINANCIAL INVESTMENT IN CLEAN ENERGY

2004 – 2015



Note: "EST" is Energy Smart Technologies. Nominal dollars

Source: Bloomberg New Energy Finance

ASIA SHINING: CLEAN ENERGY INVESTMENT BY REGION 2004 – 2015 (\$BN)

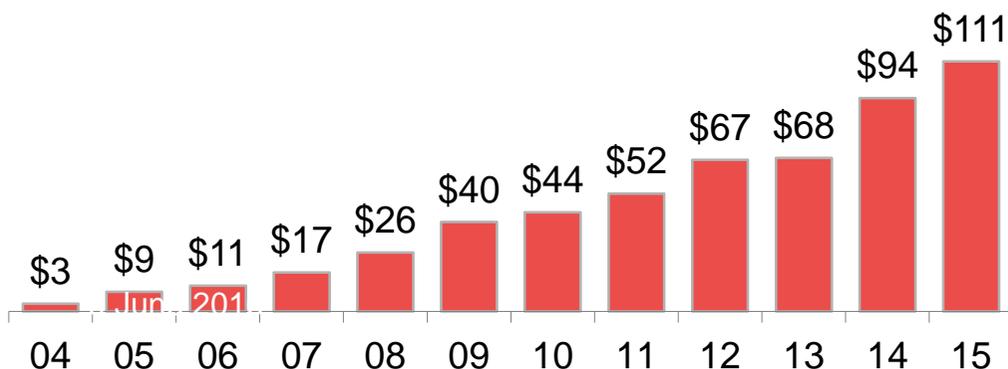
Europe



United States



China



Asia ex-China



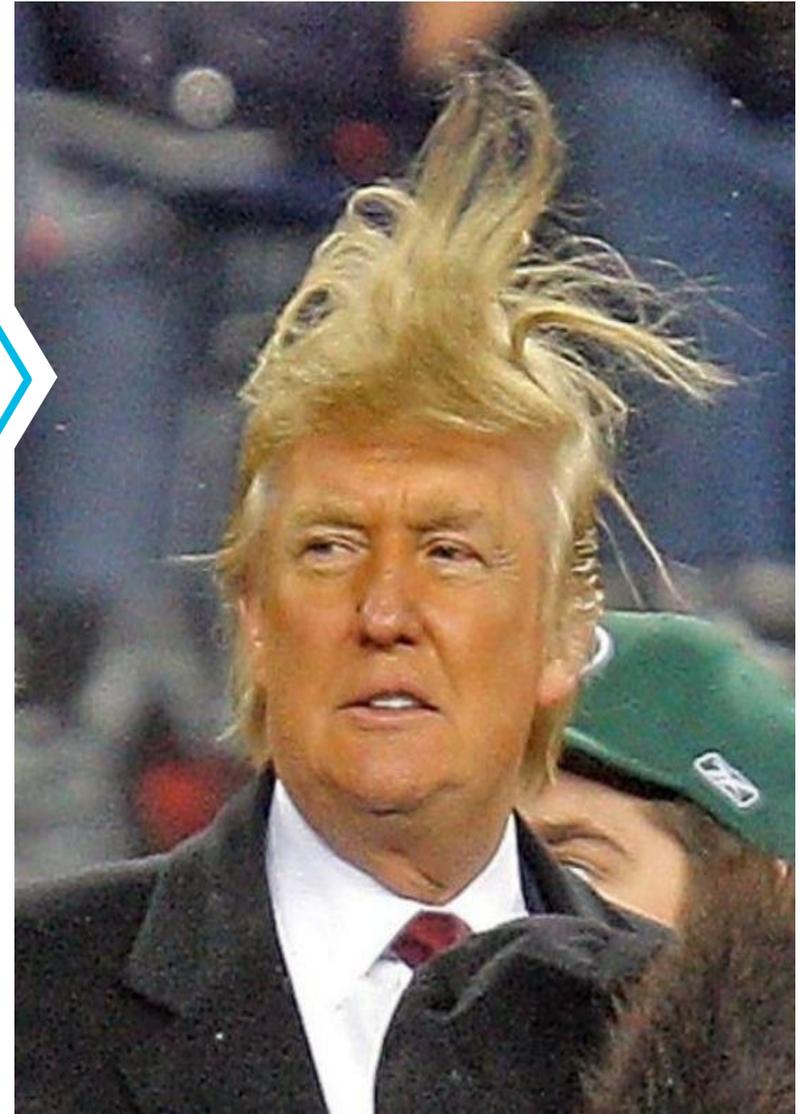
Source: Bloomberg New Energy Finance

“

Wind farms are a disaster for the environment. They kill the birds. They are very expensive in terms of energy. They're made in China.

”

*Donald Trump
Presidential
Candidate*



Picture: Michael Nagle/Bloomberg

5.845 US-cents/kWh

Acwa Power/Dubai/solar/ 2015

3 US-cents/kWh

Enel Green/Morocco/wind

3.6 US-cents/kWh

Enel Green/Mexico/solar

2.99 US-cents /kWh

DEWA/Dubai

COMPETITION

*VOLUMES/
ECONOMIES
OF SCALE*

TECHNOLOGY

POLICY

The screenshot shows a web browser displaying a Bloomberg New Energy Finance article. The browser's address bar shows the URL: <https://www.bnef.com/core/insight/14218?fromGlobalSearch=4161412018>. The page features a dark blue header with navigation links: HOME, INSIGHT (highlighted), NEWS, DATA, ANALYTICS, and SUMMIT. On the right side of the header are icons for search, user profile, help, and notifications. The main content area has a large blue background with a grid pattern. The article title is "DUBAI'S 3-CENT SOLAR: IS THIS THE NEW NORMAL?" in large white letters. Below the title, it says "by Jenny Chase / 04 May 2016". On the left side of the article content, there are two buttons: "View Full Insight" and "Download". The main text of the article is under the heading "EXECUTIVE SUMMARY" and reads: "On 1 May 2016, the Dubai Electricity and Water Agency (DEWA) announced the price levels of five bids in an 800MW PV tender that is for delivery in phases to 2020. The lowest bid was \$29.90/MWh. Bloomberg New Energy Finance was in Dubai for the Regional Conference on Clean Energy Project Financing in MENA on 3 May, where little else was discussed." Below this text is a bullet point: "• This is indeed a new record low solar power price bid, but we do not know whether..."

The screenshot shows a web browser window with the URL <https://www.bnef.com/core/insight/14212?fromGlobalSearch=4161526019>. The page features a dark blue navigation bar with the following menu items: HOME, INSIGHT (highlighted), NEWS, DATA, ANALYTICS, and SUMMIT. On the right side of the navigation bar are icons for search, user profile, help, and notifications. The main content area has a teal background with a grid pattern and the title **AUCTION BASICS: CHILE** in large white letters. Below the title is the author information: **by Ana Verena Barreto Lima / 04 May 2016**. On the left side of the article content, there are two buttons: [View Full Insight](#) and [Download](#). The main text of the article is under the heading **EXECUTIVE SUMMARY** and reads: "Chile is the third largest clean energy market in Latin America after Brazil and Mexico and historically bilateral and merchant contracts were key drivers of new clean energy project build in the country. Chile has, however, recently transitioned to an auction system to procure new supply. This note explains the nuances of that system and how it has changed recently." Below the text is a single bullet point: "• The mechanism is simple in principle: auctions are technology-blind and seek contract power to be delivered to distribution companies (offtakers) via the regulated market, within the two main power systems, Sistema Interconectado".

Japan Cabinet Approves
Introduction of Solar-Power

Wind Farm Gets Go-Ahead

Record; Gas Imports Rise 31%

Won't Match Solar, Commerzbank

Commissi

JAPAN CABINET APPROVES INTRODUCTION OF SOLAR-POWER AUCTIONING

Policy & regulation • Source: Bloomberg News • published 9 Feb 2016



Japan's cabinet has approved changes to the country's incentive program for clean energy, including the introduction of auctions for solar projects in an overhaul of the program, which is almost four years old.

Prime Minister Shinzo Abe's cabinet agreed to amend the law on which the incentive program is based. Solar auctioning was among a number of options under consideration by a panel set up by the Ministry of Economy, Trade and Industry.

Countries such as Germany and India have introduced auctioning for solar as a way to cut

LATEST IN SOLAR



EDF Energies Nouvelles Commissions
Solar-Panel Plant in Israel

4h ago • Solar • Israel

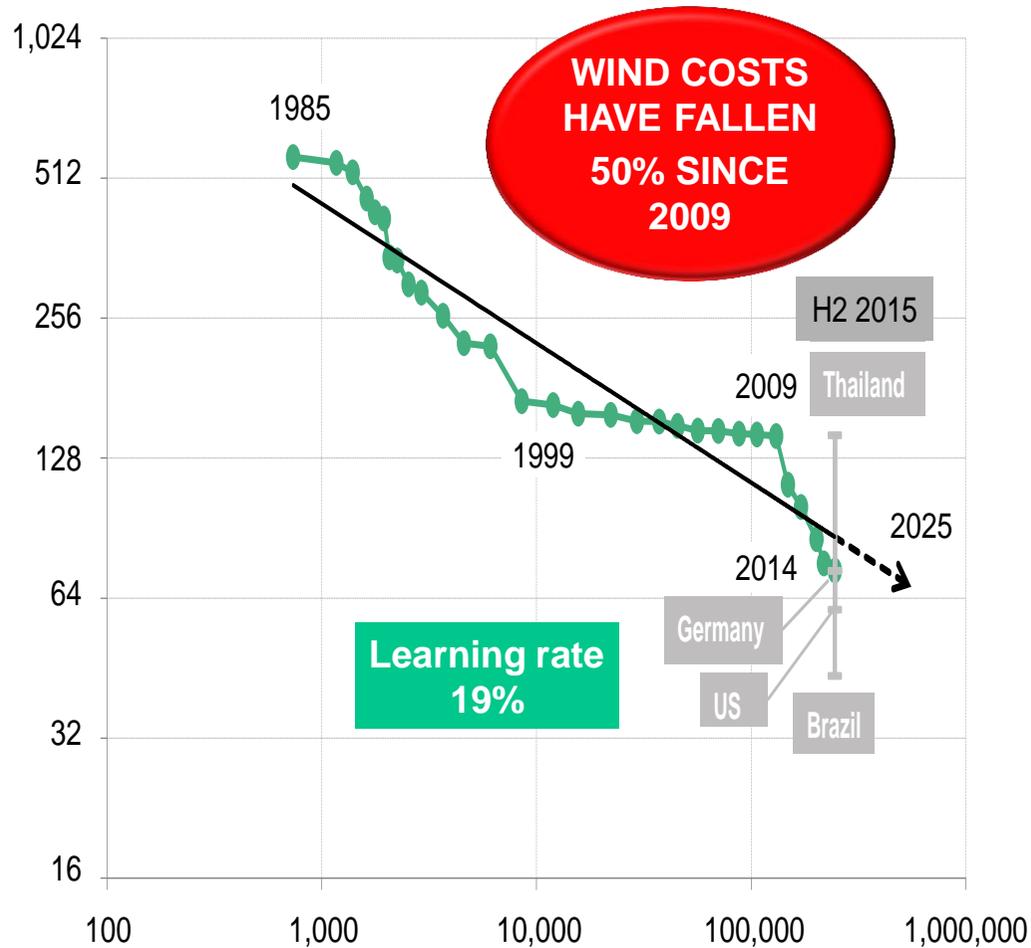


Hanergy Thin Film's Chairman Li
Resigns to Improve Governance

4h ago • Solar • China

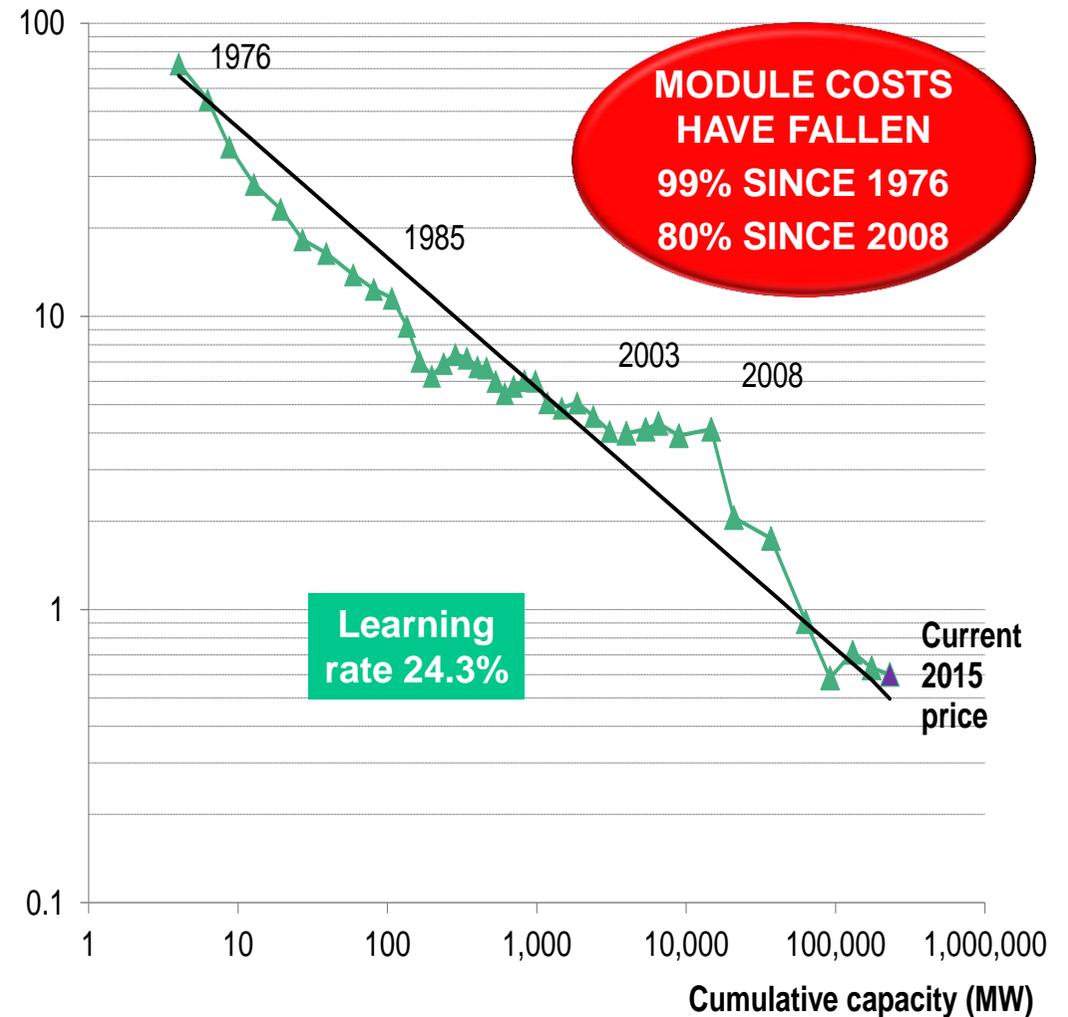
WIND AND SOLAR EXPERIENCE CURVES

ONSHORE WIND LEVELISED COST (\$/MWh)



Note: Pricing data has been inflation corrected to 2014. We assume the debt ratio of 70%, cost of debt (bps to LIBOR) of 175, cost of equity of 8% Source: Bloomberg New Energy Finance

SOLAR PV MODULE COST (\$/W)



Note: Prices are in real (2015) USD. 'Current price' is \$0.61/W Source: Bloomberg New Energy Finance, Maycock

“

We need an
energy miracle

”

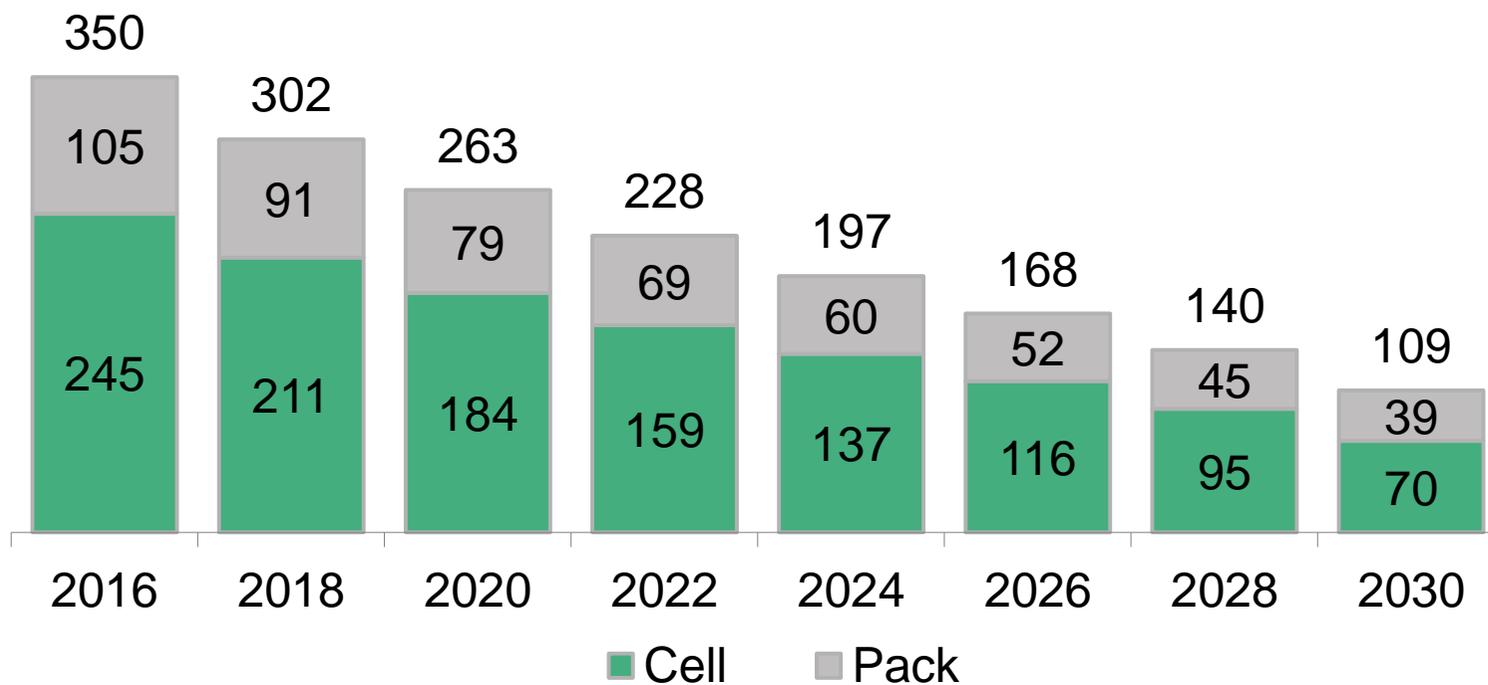
*Bill Gates
February 2016*



Picture: Bloomberg

LITHIUM-ION BATTERY PACK COST FORECAST

2016-30 (\$/KWH) – AGGRESSIVE SCENARIO



Requirements:

- Material efficiency increases **5%** per year
- Material and component costs decrease **2.5%** per year
- Batteries utilising **passive cooling**
- Plant sizes of **+40 GWh** post-2025

Note: All data in 2015 dollars

Battery costs will continue to fall through iterative technology advances, economies of scale, and manufacturing efficiencies

Source: Bloomberg New Energy Finance

- “Suicidal bidding”
- Sluggish demand
- Curtailment
- Quality

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Advanced Transport
Gas
Carbon and RECs

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